

FAUNAL REMAINS FROM EARLY BRONZE AGE AL LĀHŪN (JORDAN) AND A COMPARISON WITH CONTEMPORANEOUS ASSEMBLAGES IN THE SOUTHERN LEVANT

Eva Kaptijn, Mircea Udrescu Wim and Van Neer

Introduction

The archaeological site of Al Lāhūn (اللاهورن) (Jordan) is located along the King's Highway, a biblical and touristic route connecting 'Ammān (عمان) (105km north of Al Lāhūn) with Petra (البترا) (155km south) and Al 'Aqabah (العقبة) (285km south) (**Fig. 1**). The site is located at an altitude of 719-748m above sea level on the northern edge of Wādī al-Mūjib (وادي الموجب), which provides it with magnificent views over the 400m-deep and 5km-wide canyon.

Excavations at Al Lāhūn have been conducted by the Belgian Committee of Excavations in Jordan, in close cooperation with the Department of Antiquities of Jordan, under the direction of Denyse Homès-Fredericq (Royal Museums of Art and History [1978-2000]) and Paul Naster (Katholieke Universiteit Leuven [1978-1984]) (Homès-Fredericq 1997). Al Lāhūn is a multi-period archaeological site that sprawls over a large area of around 36ha. Remains of the major periods of occupation are found mostly at distinct locations, although a certain degree of overlap occurs (**Fig. 2**). While Early Bronze Age (EBA) (sector C1, B3) and Late Bronze/Iron Age settlements (sector D) are located on the edge of Wādī al-Mūjib overlooking the canyon, Nabatean (sectors B1+2), Late Roman/Early Byzantine (sector C2), Byzantine (sectors B1+2) and Mamluk (sectors A1+2) remains are mostly found away from the cliff, along the sides of Wādī Al Lāhūn.

The faunal assemblage discussed here was retrieved during the 2000 season and stems from the EBA settlement in sector C1, an area that was excavated between 1998 and 2000.

Pottery discovered in these *strata* positions the settlement chronologically in the EBA Ib-III period (3,350-2,250BC). However, the EBA Ib material forms only a very minor proportion of the total excavated assemblage (Swinnen 2014: 51), which suggests that the assemblage under consideration dates almost completely to the EBA II-III period (3,000-2,250BC). During the EBA II-III Al Lāhūn was surrounded by a large wall, 5-5.5m wide, enclosing an area of *ca* 4.7ha. Although only a small portion of the settlement has been excavated, it is clear that (some of) the houses were arranged along streets and alleys. Interesting is the presence of two natural depressions that were modified to function as large water reservoirs (Swinnen 2014). The presence of mortars, olive presses, pottery and various household artefacts suggests the site was inhabited by people relying on both agriculture and pastoralism for their subsistence.

Material and Methods

As mentioned above, the fauna is derived from contexts that are datable to the EBA II-III and - potentially for a small proportion - EB Ib (*ca* 3,350-3,000BC) periods. The analysis of the archaeological remains in their stratigraphic context allowed for the separation of associated osteological remains into three groups: (1) material that with certainty stems from Early Bronze Age domestic structures; (2) material from Early Bronze Age layers that may to some extent have been mixed with more recent material; (3) material that was certainly mixed and has thus been excluded from the interpretations. All material was retrieved through hand collec-



1. Location of Al Lāhūn and other sites mentioned in the text. The EBA I site of Jāwā, located far to the east, is not indicated.

tion; no sieving was carried out.

The majority of the bone assemblage was identified in the field by the second author during the 2000 excavation season. A small number of bones that could not be readily identified on the spot were shipped to Belgium for additional analysis with the aid of the modern comparative collections then housed at the Royal Museum for Central Africa in Tervuren. Identifications in the field were facilitated by the use of published atlases (Schmid 1972) and, in the case of distinguishing between sheep and goat, the work of Payne (1971, 1985) and Prummel and Frisch (1986). Measurements were taken according to the guidelines of von den Driesch (1976). Estimations of age at death were made

using the data of Silver (1976). Traces of human modification, such as cut marks or sawing, were recorded using the categories defined by Lauwerier (1988).

Results

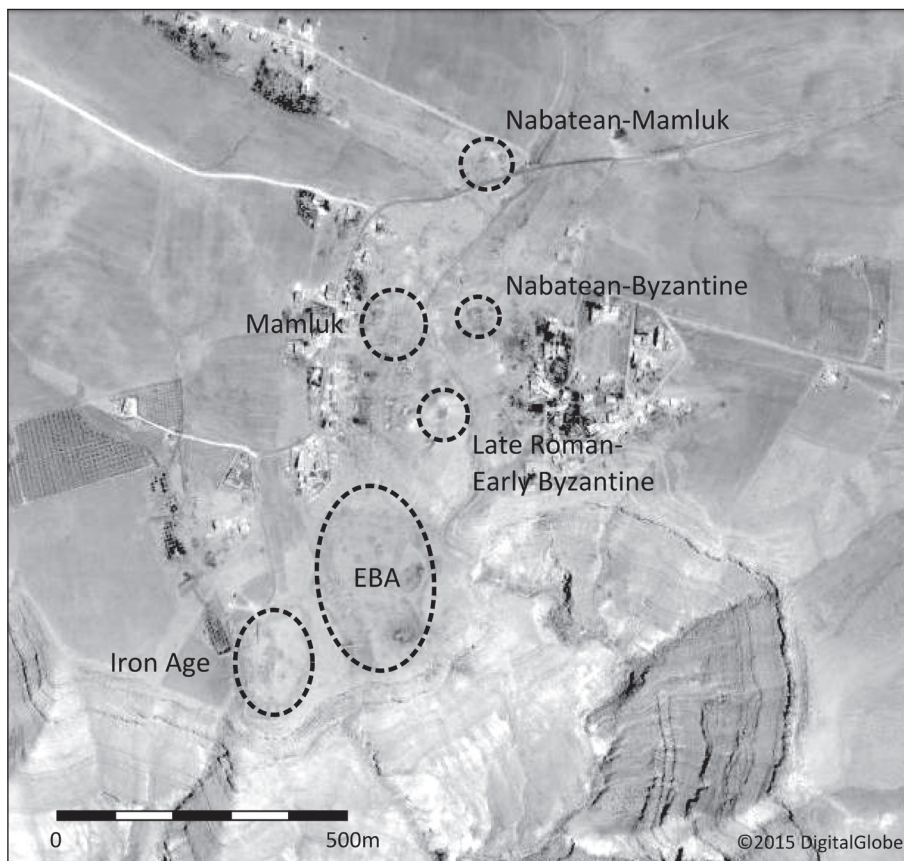
An overview of the studied material is given at **Table 1**. In total 1,342 remains have been analysed of which about half were identifiable. There were only two bird bones, which could not be identified further owing to their fragmentary state. The sole wild species that was recognised among the faunal remains is the mountain gazelle (*Gazella gazella*). A horncore of a male individual was found with the following dimensions (which clearly fall within

Table 1: Species list of the Early Bronze Age (EBA) and mixed levels from Al Lāhūn, expressed as number of identified specimens (NISP).

	EBA	cf. EBA	Total EBA	Mixed
Unidentified birds	2	-	2	-
Mountain gazelle (<i>Gazella gazella</i>)	1	2	3	1
Horse (<i>Equus ferus</i> f. <i>caballus</i>)	-	-	-	2
Donkey (<i>Equus africanus</i> f. <i>asinus</i>)	7	3	10	1
Equid (<i>Equus</i> sp.)	3	2	5	4
Pig (<i>Sus scrofa</i> f. <i>domestica</i>)	1	1	2	-
Cattle (<i>Bos primigenius</i> f. <i>taurus</i>)	8	4	12	11
Sheep (<i>Ovis ammon</i> f. <i>aries</i>)	23	9	32	15
Goat (<i>Capra aegagrus</i> f. <i>hircus</i>)	22	5	27	17
Sheep/goat	236	91	327	202
Total identified	303	117	420	241
Unidentified medium-sized mammals	252	183	435	195
Unidentified large mammals	21	14	35	16
Total unidentified	273	197	470	211

the size range of this species [*cf.* Tchernov *et al.* 1987: fig. 3]): greatest oral-aboral diameter at horncore base (29.7mm); least latero-medial diameter at base (20.1mm); index of maximum and minimum diameter × 100 (68.7). A distal humerus fragment and a phalanx can also be attributed to this species. On the distal part of the humerus a defleshing mark was noted (code 17 [Lauwerier 1988]).

Among the equid remains, two bones from the mixed layer pertain to horse judging from their large size. Ten smaller bones, all from Early Bronze Age levels, can confidently be identified as donkey (**Table 2**). It's likely that the five additional bones labelled as *Equus* sp. also belong to donkey. Worth mentioning is a scapula fragment of a donkey that shows numerous small incisions at the lateral side of



2. Map of the site of Al Lāhūn with the location of settlement traces from different periods.

its distal part (type 28 [Lauwerier 1988]) which may be related to the cutting of muscles at the level of the articulation with the humerus (Fig. 3).

The only two pig specimens to be found were a distal humerus fragment that was unfused and thus from an animal of less than one year of age (Silver 1975), and a metapodial of an individual that was even younger to judge from the very porous aspect of the bone surface.

The twelve cattle bones in the studied assemblage belong mainly to adult animals, but young individuals are also attested by two first phalanges that were unfused proximally (fusion age 18 months [cf. Silver 1975]). The vertical ramus of two mandibles was cut in a similar way (code 14 [Lauwerier 1988]), suggesting that there was a certain standardization in the processing of large cattle carcasses. One of the phalanges of the aforementioned young animals may have been a pendant: near the distal articulation it has a perforation of ~6mm in diameter (Fig. 4).

The majority of the faunal remains (92% of identified bones) belong to sheep and goat, and it appears that all skeletal elements are represented (Table 3). Around 60 elements allowed for a distinction to be made between the two species, which occurred in more or less equal proportions. The measurements of the best-preserved bones are given at Table 4. They show that both goats and sheep were medium-

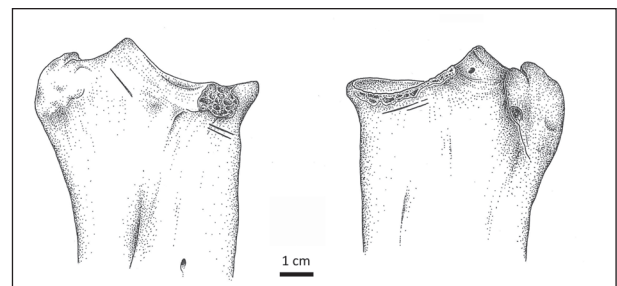
sized animals. Five of the six horncores could be identified, and all pertain to goats of ‘aegagrus’ type. Only a limited number of mandibles were available, making it impossible

Table 3: Ovicaprid skeletal elements.

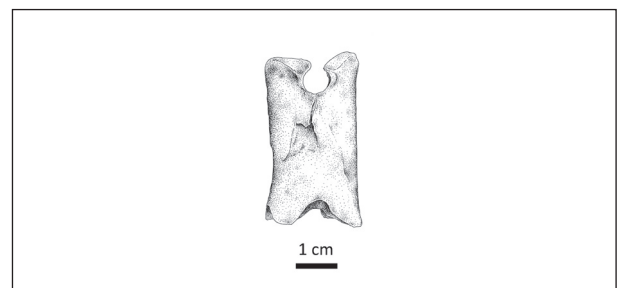
	EBA	EBA possibly mixed	TOTAL	
	NR	NR	NR	%
Skull	9	1	10	2.6
Horncore	6	-	6	1.6
Mandible	18	6	24	6.2
Isolated tooth	43	7	50	12.9
Vertebra	27	8	35	9.1
Rib	62	18	80	20.7
Scapula	16	9	25	6.5
Humerus	9	8	17	4.4
Radius	14	10	24	6.2
Ulna	5	1	6	1.6
Metacarpus	7	7	14	3.6
Pelvis	13	3	16	4.1
Femur	5	1	6	1.6
Patella	2	-	2	0.5
Tibia	11	9	20	5.2
Metatarsus	11	3	14	3.6
Metapodium	4	3	7	1.8
Astragalus	4	-	4	1.0
Calcaneum	3	3	6	1.6
Other tarsal	-	1	1	0.3
Phalanx 1	11	5	16	4.1
Phalanx 2	1	2	3	0.8
Total	281	105	386	100.0

Table 2: Measurements (mm) of the best-preserved donkey remains from the Early Bronze Age levels.

Scapula	
GLP	68.0
LG	43.0
BG	35.0
Astragalus	
GLI	45.8
GB	47.7
BFd	38.8
LmT	45.5
Calcaneum	
GL	84.3
GB	40.5



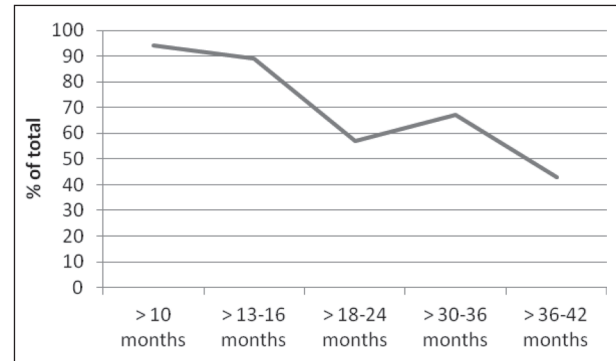
3. Donkey scapula with cut marks near its articulation.



4. Worked first phalanx of a young cattle.

to use mandibular wear stages (Grant 1982) to document slaughtering ages. Aside from two lower jaws with the second molar erupting, *i.e.* animals slaughtered before the end of their first year (Silver 1975), there are only mandibles with complete dentition. These show heavy to very heavy wear, and the same was true for the isolated maxillary teeth that were found. The dental remains thus indicate a majority of older individuals. The fusion state of the long bones (Table 5) allows for more precise documentation of slaughtering ages. The cull profile (Fig. 5) clearly shows that there was an emphasis on keeping older individuals and that herds were kept mainly for secondary products (*e.g.* milk; wool; hair; manure). Most sheep

and goats were slaughtered for their meat when they were adult. Cut marks were observed in four instances on the distal humerus (type 24 [Lauwerier 1988]) and once on the proximal



5. Survival curve for ovicaprids.

Table 4: Measurements (mm) of the best-preserved sheep (O) and goat (C) remains from the Early Bronze Age levels.

Scapula	O	O	O	O	C						
GLP	27.4	31.2	32.1	33.8	33.1						
LG	22.4	25.8	24.6	25.4	26.6						
BG	17.4	20.5	20.2	19.8	22.3						
Humerus	O	O	O	C	C						
Bd	32.5	30.5	33.6	31.5	31.3						
BT	30.2	27.7	31.3	29.8	29.1						
Astragalus	O	O	C	C							
GLI	30.5	27.4	26.8	-							
DI	17.3	15.4	14.8	14.8							
Bd	19.9	18.1	17.0	16.4							
Phalanx 1	O	O	O	O	O	O	O	O	C	C	C
GLpe	40.5	36.3	32.2	33.6	40.5	35.0	38.5	36.3	44.7	36.0	40.5
Bp	13.0	11.1	11.9	12.5	11.4	12.2	12.2	12.0	17.0	12.7	15.0
SC	9.4	8.5	9.7	10.8	8.8	9.4	9.6	9.2	13.8	10.7	11.9
Bd	11.4	10.0	10.8	11.6	10.8	11.8	12.0	10.4	17.5	-	14.4

Table 5: Fusion state of ovicaprid long bones.

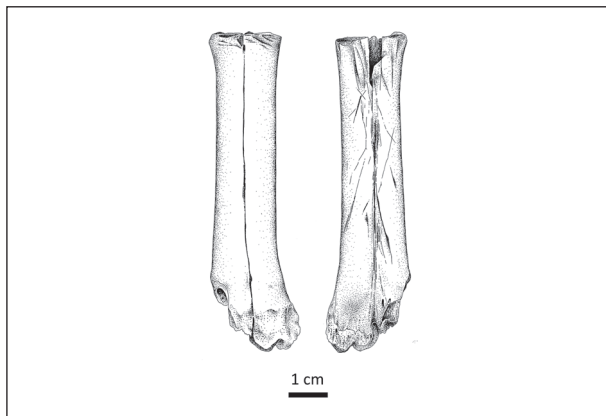
Fusing time	Element	not fused	fused	% fused
10 months	Distal humerus	-	10	
	Proximal radius	1	7	94%
13-16 months	Proximal phalanx	2	17	89%
18-24 months	Distal metacarpus	2	4	
	Distal tibia	1	4	
	Distal metatarsus	3	-	57%
30-36 months	Proximal femur	-	1	
	Proximal calcaneum	-	5	
36-42 months	Radius	3		67%
	Proximal humerus	1		
	Distal femur	2	1	
	Proximal tibia	1	2	43%

radius (type 13 [Lauwerier 1988]), indicating a separation at this articulation. Two astragali and a naviculocuboid show cut marks that are indicative of a severing of the foot at the articulation of the distal tibia and tarsal bones. Pathologies observed among the sheep and goat remains include a healed fracture of a rib and a mandible showing the results of a heavy periostitic reaction on its vestibular side, at the level of the third and fourth premolars. It seems that the latter deformation is due to the abnormal, oblique position that the P3 had taken with respect to the P4 which was in the usual position. Several unfinished bone objects were recovered, indicating that ovicaprid bone was used as a raw material. A proximal part of a goat metacarpal was found which was in the process of being transversely sectioned (**Fig. 6**). It also shows numerous fine, parallel traces at the level of the sulcus longitudinalis dorsalis, indicating that the craftsperson had started sectioning the shaft longitudinally. In addition to this unfinished object, three bone pins were found. These were in different stages of finishing and may have been made from ovicaprid long bone, possibly metapodials as suggested by the other piece mentioned.

The investigated skeletal material also included the remains of an immature human individual that, judging from the long bone measurements, was a newborn of 0-28 days' age (Fazekas and Koza 1978).

Discussion and Conclusion

The faunal assemblage excavated at Al Lāhūn has been compared with that of contemporaneous settlement sites in the wider



6. Metacarpal of goat with preparatory cut marks for the production of a bone object.

region. In total, we compiled the faunal data from 43 sites for a total of 64 contexts (**Table 6**). The bone assemblages differ greatly in terms of the quantity of identified remains, which ranges from 17 to 9,198. In general, faunal assemblages are rather small, as is also the case for Al Lāhūn (n=420). There are 25 contexts with less than 200 identified specimens, 20 assemblages with 200-500 bones, 11 contexts with 501-1,000 specimens and only eight with more than 1,000 identified bones.

Wild Versus Domesticated

Only five out of the 420 identified remains from Al Lāhūn are from wild animals (three mountain gazelle and two birds). For comparative purposes we consider only the wild mammals here, as the proportion of other wild taxa (mainly birds and fish) can vary significantly depending on recovery methods. The low percentage of wild mammals identified at Al Lāhūn (0.7%) is not unusual for the Early Bronze Age southern Levant. All sites in the region show a low proportion of hunted wild mammals compared to domesticated food animals. On average, the faunal assemblages contain *ca* 5% wild species, with values ranging from 0.3% to 12%, and a few higher values for sites with small sample sizes such as Nizzanim (Yekutieli and Gophna 1994) and Dan (Wapnish and Hesse 1991; Yekutieli and Gophna 1994). The most common wild species are gazelle (*Gazella* spp.), followed at some distance by Cervidae (*Cervus elaphus*; *Dama mesopotamica*; *Capreolus capreolus*), wild boar (*Sus scrofa*) and aurochs (*Bos primigenius*). While the numbers are always low and hunted mammals constituted only a minor part of the diet, at some sites the proportion of hunted animals seems to increase in the later stages of the Early Bronze Age (EB IV) (Alhaique 2008: 352).

Equids

Equids have been found at most EBA sites. While the presence of domestic donkey is widely accepted for this period, the few reported finds of domestic horse (Tubb and Dorrell 1993: 72; Levy *et al.* 1997: 24; Alhaique 2008) have been questioned (Kansa 2004: 292; Allentuck 2013: 108). It is probably

Table 6: List of sites in the southern Levant that have yielded Early Bronze Age fauna, with indication of the relevant publications. The sites are ordered alphabetically; for each the sub-period is indicated, as is the quantity of faunal remains expressed as number of identified specimens (NISP). Both total NISP and NISP corresponding to the sum of domesticated food animals (ovicaprids; cattle; pig) are indicated.

Site	Period	Total NISP	NISP O/C + Bos + Sus	Reference
Abū Al Kharaz	EBI-II	1107	1068	Fischer and Holden 2008
Abū Thawwāb	EB I	47	47	Köhler-Rollefson 2001
Afridar area E	EB Ia	527	346	Kansa 2004
Afridar area F	L Chal/EB Ia	303	227	Kansa 2004
Afridar area G	EB Ia	3277	3091	Kansa 2004
‘Ayy / At Tall	EB Ib	259	251	Hesse and Wapnish 2001
‘Ayy / At Tall	EB Ic-II	143	138	Hesse and Wapnish 2001
‘Ayy / At Tall	EB II	459	452	Hesse and Wapnish 2001
‘Ayy / At Tall	EB III	119	114	Hesse and Wapnish 2001
‘Arad	EB I-II	1784	1729	Kansa 2004
Azor	EB Ia	255	225	Kolska Horwitz 1999
Bāb Adh Dhirā‘	EB I-III	237	182	Finnegan 1978, 1981
Al Basāfīn	EB I	25	24	Gibbs <i>et al.</i> 2009
Al Batrāwī	EB II	57	50	Alhaique 2008; Alhaique and Di Fede 2010; Alhaique 2012
Al Batrāwī	EB IIIa	139	115	Alhaique 2008; Alhaique and Di Fede 2010; Alhaique 2012
Al Batrāwī	EB IIIb	499	358	Alhaique 2008; Alhaique and Di Fede 2010; Alhaique 2012
Dalit	EB Ib	228	210	Hellwing and Gophna 1984; Kolska Horwitz <i>et al.</i> 1996
Dalit	EB II	816	768	Hellwing and Gophna 1984; Kolska Horwitz <i>et al.</i> 1996
Dan	EB II	59	49	Wapnish and Hesse 1991
Dan	EB II-III	85	72	Wapnish and Hesse 1991
Dan	EB III	48	35	Wapnish and Hesse 1991
En Shadud	EB I	96	75	Kansa 2004
Erani	EB IIIb	752	626	Kansa 2004
Halif	EB III	1944	1886	Seeger <i>et al.</i> 1990; Levy <i>et al.</i> 1997
Halif terrace	EB Ia	336	249	Levy <i>et al.</i> 1997
Halif terrace	EB Ib	384	331	Levy <i>et al.</i> 1997
Horvat ‘Illin Tahtit	EB Ib	1962	1851	Allentuck 2013
Jāwā	EB I	2544	2423	Köhler 1981(not on map, but in text)
Jenin	EB I	776	724	al-Zawahra 1999
Jericho / As Sultan	EB III	410	374	Alhaique 2000
Kabri	EB I	123	123	Kolska Horwitz 2002
Kabri	EB II	17	17	Kolska Horwitz 2002
Kinrot	EB II	340	303	Hellwing 1988-1989
Al Lāhūn	EB II-III	420	400	Udrescu <i>et al.</i> this paper
Al Lajjūn	EB II-III	106	98	Chesson <i>et al.</i> 2005
Mādabā	EB I-II	439	430	Harrison <i>et al.</i> 2000
Megiddo - great temple	EB Ib	576	562	Wapnish and Hesse 2000; Hesse and Wapnish 2001
Megiddo - squatter	EB Ib	308	301	Wapnish and Hesse 2000; Hesse and Wapnish 2001
Megiddo - temple	EB Ib	82	78	Wapnish and Hesse 2000; Hesse and Wapnish 2001
Me’ona	EB I-II	48	44	Kolska Horwitz 1996
Me’ona	EB II	66	61	Kolska Horwitz 1996

Minsahlāt	EB III	557	523	Makarewicz 2005
Nagila	EB III	469	437	Kansa 2004
Nizzanim	EB Ia	93	41	Yekutieli and Gophna 1994
Numayra	EB III	26	22	Finnegan 1978, 1981
Tabaqat Fah̄l / Pella	EB Ib-II	813	789	Bourke <i>et al.</i> 1994
Qarn Al Kabsh	EB I-III	76	73	Savage and Metzger 2002
Qiryat ‘Ata	EB Ib	574	385	Fantalkin and Sadeh 2000; Kolska Horwitz 2013
Qiryat ‘Ata	EB II	759	648	Kolska Horwitz 2013; Maher 2014; Fantalkin and Sadeh 2000
As Sāfi	EB IIIb	1226	1070	Shai <i>et al.</i> 2014
As Sa‘īdiyyah	EB II	50	46	Tubb and Dorrell 1993
Sakan	EB Ib	106	102	de Miroschedji <i>et al.</i> 2001
Sakan	EB IIIa	401	398	de Miroschedji <i>et al.</i> 2001
Sakan	EB IIIb	200	199	de Miroschedji <i>et al.</i> 2001
Shoham	EB Ib	179	109	Kolska Horwitz 2007
Ash SHūnah	EB Ia	223	223	Baird and Philip 1994
Ash SHūnah	EB Ib	335	335	Baird and Philip 1994
Te’o	EB Ia	26	24	Kolska Horwitz 2001
Uvda	EB II	64	49	Kolska Horwitz <i>et al.</i> 2001
Yaqush	EB I	524	475	Kolska Horwitz <i>et al.</i> 2001
Yaqush	EB II	397	387	Kolska Horwitz <i>et al.</i> 2001
Yaqush	EB III	349	332	Hesse and Wapnish 2001
Yarmouth	EB II	216	216	Davis 1988
Yarmouth	EB IIIa	882	882	Davis 1988
Yarmouth	EB IIIb	77	77	Davis 1988
Az Zayraqūn	EB III	9198	8883	Dechert 1995

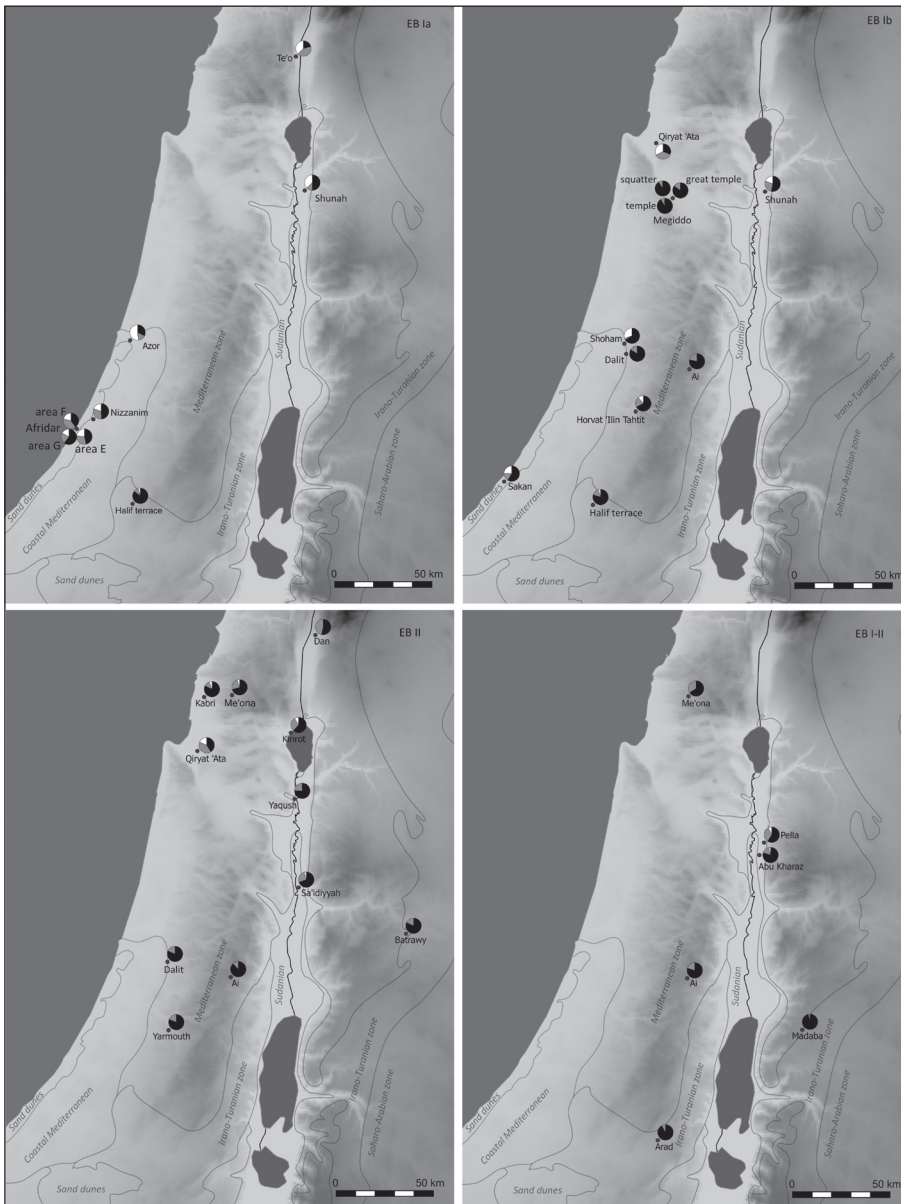
no coincidence that the only horse remains found at Al Lāhūn were from disturbed, likely younger contexts. At Al Lāhūn equids form a restricted proportion of the identified faunal assemblage (3.6%), as is also the case at most other sites, *e.g.* Al Lajjūn (اللجون) (Chesson *et al.* 2005), Jāwā (جاوا) (Köhler 1981), Qiyat ‘Ata (Kolska Horwitz 2003, 2013), Arad (Davis 1976), Dalit (Kolska Horwitz *et al.* 1996), as-Sa‘īdiyyah (السعيدية) (Tubb and Dorrell 1993), as-Sāfi (Shai 2014), Halif (Seger *et al.* 1990) and Munsahlāt (منسهلات) (Makarewicz 2005). However, at a few sites equids were found in much higher proportions (up to 25%), *e.g.* Al Batrāwī (البيراوي) (EB II-III) (Alhaique 2008, 2012), the settlements of Bāb Adh DHirā‘ (باب النزاع) (EB I-III) (Finnegan 1978, 1981) and En Shadud (Kansa 2004), and also several sites on the southern coastal plain, *i.e.* ‘Erani (Kansa 2004), Azor (Kolska Horwitz 1999), Halif terrace (Levy *et al.* 1997) and Nizzanim (Yekutieli and Gophna 1994). The presence of equids has often been linked to trade, which fits well with the EBA I coastal-plain sites

where ample evidence for contact with Egypt has been found (Levy *et al.* 1997; Kansa 2004: 291). Exceptional is the frequent occurrence of cut marks on equid bones at Al Batrāwī. At this site, equid bones show cut marks as frequently as those of cattle. Furthermore, the age profiles and levels of fragmentation are also similar to cattle, suggesting that equids and cattle received similar treatment, with equids in all likelihood being eaten. This processing of equids is not restricted to a single context, but occurs throughout all phases of the site (Alhaique 2008: 354). At Afridar a single cut mark was found on a donkey bone which has been related to potential skinning. At this site equid was most likely not eaten. Not only is the fragmentation rate much lower than that of consumed species, but equid bones are also often found in partial articulation (Kansa 2004: 291). The Al Lāhūn donkey scapula with cut marks is therefore not unique, but being just a single bone no further conclusions can be drawn from it about the possible use of equids for food or as a source of raw material.

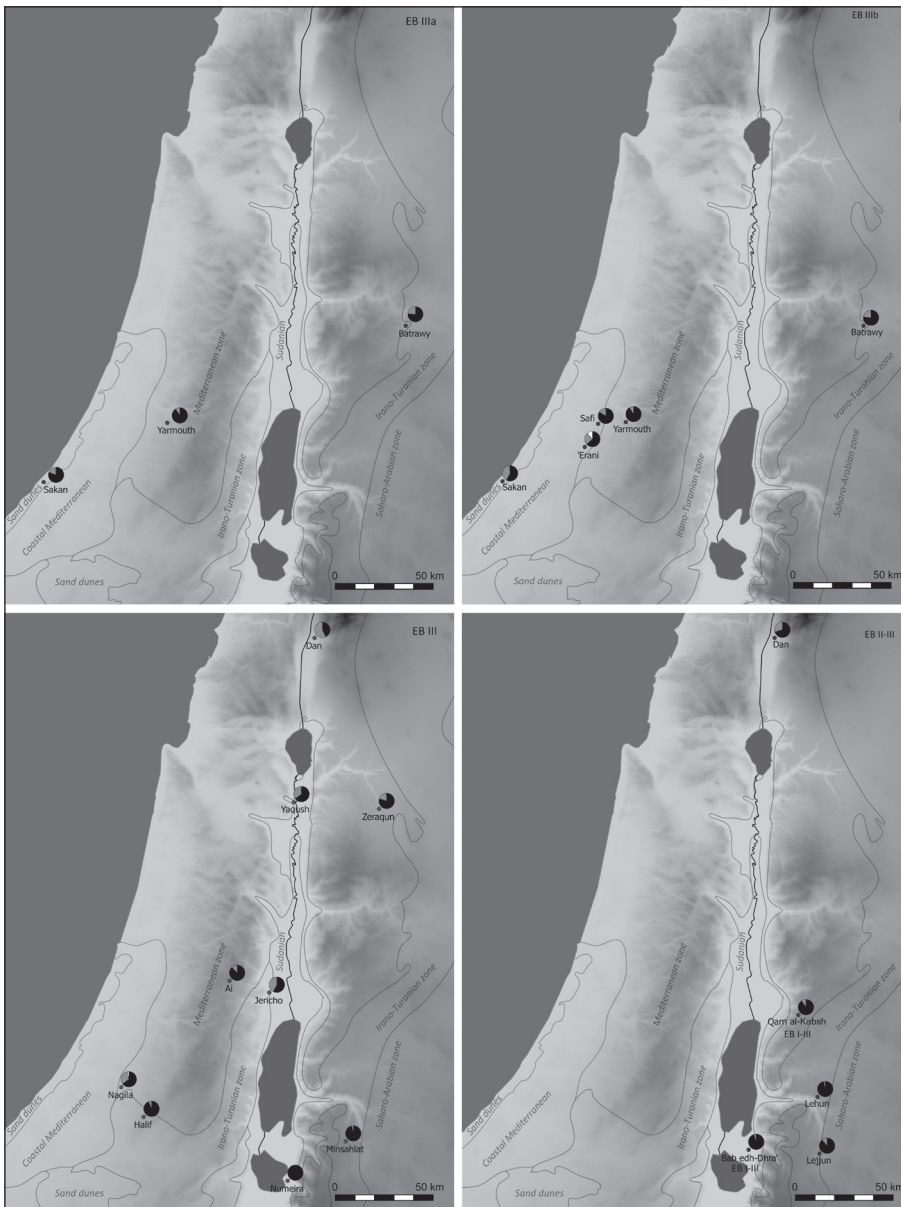
Pig

Using raw data compiled from the sites listed at **Table 6**, the proportions of the major domestic food animals (ovicaprines; cattle; pig) have been calculated and the results plotted on the maps at **Figs 7** and **8**. Notwithstanding temporal and functional differences, the composition of faunal assemblages is clearly linked to the environment. Pigs are restricted to moister and more wooded regions, while the number of ovicaprids increases towards the more arid Irano-Turanian and Saharo-Arabian zones. Higher proportions of pig bone are found in the coastal Mediterranean zone, as well as in the northern river valleys like those of Yezreel

and the northern Jordan. However, there is also a chronological differentiation in the frequency of pigs. Relatively high proportions of pig bone are present in EBA Ia and EB Ib contexts (as well as during the preceding Chalcolithic period), but their numbers decrease rapidly afterwards and during the later phases of the Early Bronze Age pigs only occur sporadically. It seems likely that this virtual disappearance of pig reflects the aridification that took place towards the end of the Early Bronze Age (Frumkin *et al.* 2001: 1184; Bar-Matthews *et al.* 2003; Cordova 2007: 190; Rosen 2007: 85). The small number of pig bones in the Al Lāhūn assemblages is mirrored at other sites of similar age.



7. Percentage of sheep/goat (black), cattle (grey) and pig (white) during EB I and II periods (Jāwā [EB I] outside map to the east: 9% cattle; 91% sheep/goat; no pig).



8. Percentage of sheep/goat (black), cattle (grey) and pig (white) during EB III periods.

Secondary Products

The two pig bones from Al Lāhūn are from animals that did not survive beyond one year of age. This is in line with evidence from other Early Bronze Age sites where pigs were always slaughtered young, before the age of two years (Bourke *et al.* 1994: 123; Kolska Horwitz 1996: 8, 1999: 36; Kansa 2004: 284; Kolska Horwitz 2013: 65). This is indicative of management focused on meat production.

Adults usually predominate among cattle remains found in the Early Bronze Age southern Levant, *e.g.* at *Tabaqat Fahl/Pella* (طبقة فحل) (Bourke *et al.* 1994: 123), *Jenin* (جنين) (al-Zawahra 1999), *Afridar* (Kansa 2004: 286) and *Qiryat Ata* (Kolska Horwitz 2013: 67). Al-

though the sample is small, this seems also to be the case Al Lāhūn. These slaughtering ages suggest that cattle were kept for meat, milk and potentially traction. While traction may well have been a reason to keep cattle, there is little direct evidence for it. At *Afridar*, many phalanges show exostoses which might have been caused by draught activity, but which could just as well have resulted from old age. As other bones in the assemblage show relatively few pathologies, it has been suggested that cattle may have been used for traction on a non-intensive scale (Kansa 2004: 284). Deformations were also attested at *Jericho/Tall as-Sultān* (تل السلطان) (Alhaique 2000: 310), but at Al Lāhūn no such pathologies have been found.

The age profiles of sheep and goat - the major species in the southern Levant - show that these animals were managed in diverse ways at different sites in the region. At Dan (Wapnish and Hesse 1991: 29) and Halif (Levy *et al.* 1997: 28) the absence of neonates and very young animals has been taken to indicate that herds were kept away from the site, while at other sites the presence of neonates suggests that flocks were at or near the site, *e.g.* Al Lāhūn. At most sites in the region the use of secondary products has been suggested, because of the rather late slaughtering of sheep and goats, but nowhere have strong indications been found for intensive specialisation in one or more secondary products. A focus on meat production has been suggested for a few sites, such as EB Ia Azor (Kolska Horwitz 1999), EB I-III Qarn Al Kabsh (قرن الكبش) (Savage and Metzger 2002) and the EB Ib squatter-occupation phase at Megiddo (Tall al-Mutasallim) (Wapnish and Hesse 2000), where most sheep and goats were killed at a young age - as were the sheep at EB III Aṣ Sāfi (Shai *et al.* 2014). However, at the majority of Early Bronze Age sites, including Al Lāhūn, 50-70% of sheep and goat reached maturity, *i.e.* Ṭabaqat Fahḷ/Pella (Bourke *et al.* 1994: 123), Al Handaqūq North (الهندقوق) (Mabry 1996: 146), Mādabā (Harrison *et al.* 2000: 226), Al Batrāwī (Alhaique 2008: 353, 2012: 345), Jenin (al-Zawahra 1999: 28), Yarmouth (Davis 1988: 147), Horvat Ilin Tahtit (Allentuck 2013: table 125-6), Qiryat ‘Ata (Kolska Horwitz 2013: 67), Kinrot (Hellwing 1988-1989: 214) and the goats at Aṣ Sāfi (Shai *et al.* 2014). This delayed slaughtering age suggests wool may have been important, alongside non-intensive milk production and breeding. The fact that, at Afridar for example, very few animals were killed before they reached one year of age (Kansa 2004) seems to indicate that milk was not the primary focus. Otherwise the proportion of animals slaughtered young would have been much higher. The higher kill-off of subadults shows that meat was important at Afridar, while the predominance of females among the older animals found at the site was presumably related to breeding. Furthermore, the fact that sheep outnumbered goats suggests that wool was important, a supposition tentatively supported by the recovery of many spindle whorls in the excavations (Kansa 2004: 284).

Concluding, it can be said that the small faunal assemblage from Al Lāhūn corresponds rather well to wider trends in the animal economies of the southern Levant during the Early Bronze Age. Hunting played a minor role in subsistence, while among the domestic food animals sheep and goat were most frequently slaughtered, followed by cattle and pig. The representation of these species is heavily correlated with environmental conditions and is comparable to that seen at adjacent sites. Pigs were kept for their meat, while cattle and ovicaprids were also providers of secondary products (milk plus manure, wool and hair in the case of sheep and goats, and traction in the case of cattle). Donkeys must have been primarily used for transport, as no convincing evidence was found for consumption.

Acknowledgements

This article was written within the scope of the *Belgian Archaeological Expeditions to the Orient. Heritage in Federal Collections* project (www.BArEO.be), funded by the Belgian Science Policy Office (BELSPO). The drawings at figures 3, 4 and 6 were made by Alain Reygel of the Royal Museum of Central Africa, to whom the authors express their utmost gratitude.

Eva Kaptijn
Royal Belgian Institute of Natural Sciences
Vautierstraat 29
1000 Brussels, Belgium

Mircea Udrescu
Royal Belgian Institute of Natural Sciences
Vautierstraat 29
1000 Brussels, Belgium

Wim Van Neer
Royal Belgian Institute of Natural Sciences
Vautierstraat 29
1000 Brussels, Belgium
and
University of Leuven,
Laboratory of Biodiversity and Evolutionary Genomics,
Ch. Debériotstraat 32,
3000 Leuven, Belgium

Bibliography

Alhaique, F.
2000 Appendix B. Faunal Remains of the 1998 Excavation Campaign at Jericho. Pp. 297-317 in N. Marchetti and L. Nigro (eds.), *Quaderni*

- di Gerico 2. Excavations at Jericho, 1998. Preliminary Report on the Second Season of Archaeological Excavations and Surveys at Tell es-Sultan, Palestine.* Rome: La Sapienza University of Rome / Palestinian Department of Antiquities.
- 2008 Appendix A. Pp. 327-358 in L. Nigro (ed.), *Khirbet al-Batrawy II: The EB II City-Gate, the EB II-III Fortifications, the EB II-III Temple. Preliminary Report of the Second (2006) and Third (2007) Seasons of Excavations.* Rome La Sapienza Studies on the Archaeology of Palestine and Transjordan 6. Rome: La Sapienza University of Rome.
- 2012 Appendix A. Faunal Remains. Pp. 333-364 in L. Nigro (ed.), *Khirbet al Batrawy II. The EB II-III Triple Fortification Line and the EB IIIB Quarter inside the City-Wall. Preliminary Report of the Fourth (2008) and Fifth (2009) Seasons of Excavations.* Rome La Sapienza Studies on the Archaeology of Palestine and Transjordan 8. Rome: La Sapienza University of Rome.
- Alhaique, F. and Di Fede, C.
- 2010 Abstract Poster Session: Archaeozoological Study of the Faunal Remains from the Early Bronze Age Site of Khirbet al-Batrawy, Jordan. Pp. 267-271 in P. Matthiae, F. Pinnock, L. Nigro and N. Marchetti (eds.), *Proceedings of the 6th International Congress on the Archaeology of the Ancient Near East (ICAANE) (Roma 5-10 maggio 2008).* Wiesbaden: Harrassowitz Verlag.
- Allentuck, A.
- 2013 *Human-Livestock Relations in the Early Bronze Age of the Southern Levant.* Unpublished PhD Dissertation, University of Toronto.
- Bar-Matthews, M.; Ayalon, A.; Gilmour, M.; Matthews, A. and Hawkesworth, C.J.
- 2003 Sea-Land Oxygen Isotopic Relationships from Planktonic Foraminifera and Speleothems in the Eastern Mediterranean Region and their Implication for Paleorainfall during Interglacial Intervals. *Geochimica et Cosmochimica Acta* 67/17: 3181-3199.
- Baird, D. and Philip, G.
- 1994 Preliminary Report on the Third (1993) Season of Excavations at Tell esh-Shuna North. *Levant* 26: 111-133.
- Bourke, S.J.; Sparks, R.T.; Sowada, K.N. and Mairs, L.D.
- 1994 Preliminary Report on the University of Sydney's Fourteenth Season of Excavation at Pella (Tabaqat Fahl) in 1992. *ADAJ* 38: 81-126.
- Chesson, M.S.; Makarewicz, C.; Kuijt, I. and Whiting, C.
- 2005 Results of the 2001 Kerak Plateau Early Bronze Age Survey. *AASOR* 59: 1-62.
- Cordova, C.E.
- 2007 *Millennial Landscape Change in Jordan. Geoarchaeology and Cultural Ecology.* Tuscon: The University of Arizona Press.
- Davis, S.J.
- 1976 Mammal Bones from the Early Bronze Age City of Arad, Northern Negev, Israel: Some Implications Concerning Human Exploitation. *Journal of Archaeological Science* 3: 153-164.
- 1988 The Mammal Bones: Tell Yarmuth 1980-1983. Pp. 143-149 in P. de Miroschedji (ed.), *Yarmouth I. Rapports Sur les Trois Premières Campagnes de Fouilles à Tel Yarmouth (Israël) (1980-1982).* Éditions Recherche sur les Civilisations 76. Paris: Editions Recherche sur les Civilisations.
- de Miroschedji, P.; Sadek, M.; Faltings, D.; Boulez, V.; Naggiar-Moliner, L.; Sykes, N. and Tengberg, M.
- 2001 Les Fouilles de Tell es-Sakan (Gaza): Nouvelles Données sur les Contacts Egypto-Cananéens aux IV^e-III^e Millénaires. *Paléorient* 27/2: 75-104.
- Dechert, B.
- 1995 The bone remains from Hirbet Ez-Zeraqon. Pp. 79-87 in H. Buitenhuis and H.-P. Uerpmann (eds.), *Archaeozoology of the Near East II. Proceedings of the Second International Symposium on the Archaeozoology of Southwestern Asia and Adjacent Areas.* Leiden: Backhuys Publishers.
- Driesch, A. von den
- 1976 *A Guide to the Measurement of Animal Bones from Archaeological Sites.* Peabody Museum Bulletin 1. Cambridge (MA): Harvard University.
- Fantalkin, A. and Sadeh, M.
- 2000 A Salvage Excavation at an Early Bronze Age Settlement on Ha-Shophitim Street, Qiryat 'Ata. *Tel Aviv* 2000/1: 28-60.
- Fazekas, I.G. and Koza, F.
- 1978 *Forensic Fetal Osteology.* Budapest: Akadémiai Kiadó.
- Finnegan, M.
- 1978 Faunal Remains from Bab edh-Dhra', 1975. Pp. 51-54 in D.N. Freedman (ed.), *Preliminary Excavation Reports: Bab edh-Dhra', Sardis, Meiron, Tell el-Hesi, Carthage (Punic).* AASOR 43. Cambridge (MA): American Schools of Oriental Research.
- 1981 Faunal Remains from Bab edh-Dhra. Pp. 1977-1985 in W.E. Rast and R.T. Schaub (eds.), *The Southeastern Dead Sea Plain Expedition: An Interim Report of the 1977 Season.* AASOR 46. Cambridge (MA): American Schools of Oriental Research.
- Fischer, P.M. and Holden, T.
- 2008 Climate, Fauna, Flora: A Synopsis. Pp. 303-306 in P.M. Fischer (ed.), *Tell Abu al-Kharaz in the Jordan Valley I. The Early Bronze Age.* Vienna: Verlag der Österreichischen Akademie der Wissenschaften.
- Frumkin, A.; Kadan, G.; Enzel, Y. and Eyal, Y.
- 2001 Radiocarbon Chronology of the Holocene Dead Sea: Attempting a Regional Correlation. *Radiocarbon* 43: 1179-1189.
- Gibbs, K.; Allentuck, A.; Kadowaki, S. and Banning, E.B.
- 2009 Early Bronze I Occupation at al-Basatin, in Wadi Ziqlab, Northern Jordan. *BASOR* 355: 31-50.

- Grant, A.
1982 The Use of Tooth Wear as a Guide to Age of Domestic Ungulates. Pp. 91-108 in B. Wilson, C. Grigson and S. Payne (eds.), *Ageing and Sexing Animal Bones from Archaeological Sites*. BAR British Series 109. Oxford: BAR Publishing.
- Harrison, T.P.; Hesse, B.; Savage, S.H. and Schnurrenberger, D.W.
2000 Urban Life in the Highlands of Central Jordan. A Preliminary Report of the 1996 Tall Madaba Excavations. *ADAJ* 44: 211-229.
- Hellwing, S.
1989 Faunal Remains from the Early Bronze and Late Bronze Ages at Tel Kinrot. *Tel Aviv* 18-19: 212-220.
- Hellwing, S. and Gophna, R.
1984 The Animal Remains from the Early and Middle Bronze Ages at Tel Aphek and Tel Dalit: A Comparative Study. *Tel Aviv* 11: 48-59.
- Hesse, B. and Wapnish, P.
2001 Commodities and Cuisine: Animals in the Early Bronze Age of Northern Palestine. Pp. 251-282 in S.R. Wolff (ed.), *Studies in the Archaeology of Israel and Neighboring Lands, in Memory of Douglas L. Esse*. Chicago / Atlanta: Oriental Institute of the University of Chicago / American Schools of Oriental Research.
- Homès-Fredericq, D.
1997 *Découvrez Lehun et la Voie Royale. Les fouilles belges en Jordanie*. Bruxelles: Comité Belge des Fouilles en Jordanie.
- Kansa, S.W.
2004 Animal Exploitation at Early Bronze Age Ashqelon, Afridar: What the Bones Tell us - Initial Analysis of the Animal Bones from Areas E, F and G. *Atiqot* 45: 279-297.
- Köhler-Rollefson, I.
2001 The Animal Bones. Pp. 211-213 in Z. Kafafi (ed.), *Jebel Abu Thawwab (Er-Rumman), Central Jordan. The Late Neolithic and Early Bronze Age I occupations*. Berlin: Ex Oriente.
- Köhler, I.
1981 Appendix E. Animal Remains. Pp. XX-XX in S. Helms (ed.), *Jawa, Lost City of the Black Desert*. London: Methuen.
- Kolska Horwitz, L.
1996 The Fauna Remains Rom Me'ona. *Atiqot* 28: 37-39.
1999 The Fauna. Pp. 33-39 in A. Golani and E.C.M. Van den Brink (eds.), *Salvage Excavations at the Early Bronze Age IA Settlement of Azor*. *Atiqot* 38.
2001 The Mammalian Fauna. Pp. 171-194 in E. Eisenberg, A. Gopher and R. Greenberg (eds.), *Tel Te'o. A Neolithic, Chalcolithic, and Early Bronze Age site in the Hula Valley*. IAA Reports 13. Jerusalem: Israel Antiquities Authority.
2002 Animal Bones. Pp. 395-401 in N.A. Scheftelowitz and R. Oren (eds.), *Tel Kabri: The 1986-1993 Excavations*. Monograph Series of the Institute of Archaeology of Tel Aviv University 20. Tel Aviv: Institute of Archaeology, Tel Aviv University.
- 2003 Early Bronze Age Animal Exploitation at Qiryat Ata. Pp. 225-241 in A. Golani (ed.), *Salvage Excavations at the Early Bronze Age Site of Qiryat Ata*. IAA Reports 18. Jerusalem: Israel Antiquities Authority.
- 2007 Faunal Remains from Late Chalcolithic-Bronze Age Dwelling and Burial Caves at Shoham (North), Lod Valley. *Atiqot* 55: 1-15.
- 2013 Early Bronze Age Fauna from Qiryat Ata - Area O. *Atiqot* 75: 61-70.
- Kolska Horwitz, L.; Hellwing, S. and Tchernov, E.
1996 Patterns of Animal Exploitation at Early Bronze Age Tel Dalit. Pp. 193-216 in R. Gophna, B. Cresson and E. Friedmann (eds.), *Excavations at Tel Dalit: an early Bronze Age walled town in Central Israel*. Tel Aviv: Ramot Publishing House, Tel Aviv University.
- Kolska Horwitz, L.; Tchernov, E. and Mienis, H.K.
2001 Archaeozoology and Archaeomalacology of Site 917 in the 'Uvda Valley. *Atiqot* 42: 121-127.
- Lauwerier R.C.G.M.
1988 *Animals in Roman Times in the Dutch Eastern River Area*. Amersfoort: Rijksdienst voor het Oudheidkundig Bodemonderzoek.
- Levy, T.E.; Alon, D.; Rowan, Y.; Brink, E.C.M.v.d.; Grigson, C.; Holl, A.; Smith, P.; Goldberg, P.; Witten, A.J.; Kansa, E.; Moreno, J.; Yekutieli, Y.; Porat, N.; Golden, J.; Dawson, L. and Kersel, M.
1997 Egyptian-Canaanite Interaction at Nahal Tillah, Israel (ca. 4500-3000BC): An Interim Report on the 1994-1995 Excavations. *BASOR* 307: 1-51.
- Mabry, J.B.
1996 Early Town Development and Water Management in the Jordan Valley: Investigations at Tell el-Handaqq North. Pp. 115-154 in W.G. Dever (ed.), *Preliminary Excavation Reports. Sardis, Idalion, and Tell el-Handaqq North*. AASOR 53. Cambridge (MA): American Schools of Oriental Research.
- Maher, E.F.
2014 Animal Based Economy and Local Ecology: the Early Bronze Age II Fauna from Qiryat Ata - Area S. *Atiqot* 79: 99-109.
- Makarewicz, C.
2005 Pastoral Production in a Corporate System: The Early Bronze Age at Khirbet el-Minsahlat, Jordan. Pp. 163-177 in H. Buitenhuis, A.M. Choyke, L. Martin, L. Bartosiewicz and M. Mashkour (eds.), *Archaeozoology of the Near East VI: Proceedings of the Fifth International Symposium on the Archaeozoology of Southwestern Asia and Adjacent Areas*. Groningen: ARC Publications.
- Payne, S.
1971 A Metrical Distinction between Sheep and Goat Metacarpals. Pp. 295-305 in P.J. Ucko and G.W. Dimbleby (eds.), *The Domestication and Exploitation of Plants and Animals*. London: G. Duckworth.

- 1985 Morphological Distinction between the Mandibular Teeth of Young Sheep and Goats. *Journal of Archaeological Science* 12: 139-146.
- Prummel, W. and Frisch, H.J.
- 1986 A Guide for the Distinction of Species, Sex and Body Side in Bones of Sheep and Goat. *Journal of Archaeological Science* 13: 567-577.
- Rosen, A. M.
- 2007 *Civilizing Climate. Social Responses to Climate Change in the Ancient Near East*. Lanham: Altamira Press.
- Savage, S.H. and Metzger, M.L.
- 2002 Moab Archaeological Resource Survey: Test Excavations and Faunal Analysis from the 2001 Field Season. *ADAJ* 46: 107-123.
- Schmid, E.
- 1972 *Atlas of Animal Bones, Tierknochenatlas*. Amsterdam: Elsevier.
- Seger, J.D.; Baum, B.; Borowski, O.; Cole, D.P.; Forshey, H.; Futato, E.; Jacobs, P.F.; Laustrup, M.; Seger, P.O.C. and Zeder, M.
- 1990 The Bronze Age Settlements at Tell Halif: Phase II Excavations, 1983-1987. *BASOR Supplementary Studies* 26: 1-32.
- Shai, I.; Greenfield, H.J.; Regev, J.; Boaretto, E.; Eliyahu-Behar, A. and Maeir, A.M.
- 2014 The Early Bronze Age Remains at Tell es-Sāfi/Gath: An Interim Report. *Tel Aviv* 41/1: 20-49.
- Silver I.A.
- 1975 The Ageing of Domestic Animals. Pp. 283-302 in D. Brothwell and E. Higgs (eds.), *Science in Archaeology*. London: Thames and Hudson.
- Swinnen, I.M.
- 2014 Curvilinear Domestic Structures in the Prehistoric Eastern Mediterranean Region and Evidence from the Early Bronze I Period at Al Lāhūn in Jordan. Pp. 43-70 in I.M. Swinnen and E. Gubel (eds.), *“From Gilead to Edom” Studies in the archaeology and history of Jordan in honor of Denyse Homès-Fredericq on the Occasion of her Eightieth Birthday*. Akkadica Supplementum 12. Tchernov, E.; Dayan, T. and Yom-Tov, Y.
- 1987 The Paleogeography of Gazella Gazella and Gazella Dorcas during the Holocene of the Southern Levant. *Israel Journal of Zoology* 34: 51-59.
- Tubb, J.N. and Dorrell, P.G.
- 1993 Tell es-Sa’idiyeh: Interim Report on the Sixth Season of Excavations. *PEQ* 125: 50-74.
- Wapnish, P. and Hesse, B.
- 1991 Faunal Remains from Tel Dan: Perspectives on Animal Production at a Village, Urban and Ritual Center. *Archaeozoologia* 4/2: 9-86.
- 2000 Mammal Remains from the Early Bronze Sacred Compound. Pp. 429-462 in I. Finkelstein, D. Ussishkin and B. Halpern (eds.), *Megiddo III: The 1992-1996 Seasons*. Tel Aviv: Yass Publications in Archaeology.
- Yekutieli, Y. and Gophna, R.
- 1994 Excavations at an Early Bronze Age Site near Nizzanim. *Tel Aviv* 21: 162-185.
- al-Zawahra, M.A.M.
- 1999 *The Faunal Remains from Tell Jenin, Northern West Bank - Palestine*. Unpublished Master’s thesis, University of Leuven.